Openness of Spanish scholarly journals as measured by access and rights

Remedios Melero. Instituto de Agroquímica y Tecnología de Alimentos-CSIC, Valencia, Spain
Agustín Escardino 7 46980 Paterna, Spain. ORCID 0000-0002-1813-8783. Email: rmelero@iata.csic.es

Mikael Laakso. Information Systems Science, Department of Management and Organisation, Hanken School of Economics, Helsinki, Finland. ORCID: 0000-0003-3951-7990. Email:mikael.laakso@hanken.fi

Miguel Navas-Fernández. Library and Information Science Faculty, University of Barcelona, Barcelona, Spain. ORCID: 0000-0002-5191-238X. Email: miguel.navas@ub.edu

Abstract

Metrics regarding Open Access (OA) availability for readers and the enablers of redistribution of content published in scholarly journals, i.e. content licenses, copyright ownership, and publisher-stipulated self-archiving permissions are still scarce. This study implements the four core variables (reader rights, reuse rights, copyrights, author posting rights) of the recently published Open Access Spectrum (OAS) to measure the level of openness in all 1728 Spanish scholarly journals listed in the Spanish national DULCINEA database at the end of 2015. In order to conduct the analysis additional data has been aggregated from other bibliographic databases and through manual data collection (such data includes the journal research area, type of publisher, type of access, self-archiving and reuse policy, and potential type of Creative Commons (CC) licence used). 79% of journals allowed self-archiving in some form, 13.5% did not specify any copyright terms and 37% used CC licenses. From the total journals (1728), 1285 (74.5%) received the maximum score of 20 in reader rights. For 72% of journals, authors retain or publishers grant broad rights which include author reuse and authorisation rights (for others to re-use). The OAS-compliant results of this study enable comparative studies to be conducted on other large populations of journals.

Key points

- The Open Access Spectrum (OAS), and associated criteria of the Open Access Spectrum EvaluationTool, can be used to evaluate individual journals as well as to summarise the openness of a large number of journals.
- The 1728 Spanish journals included in the study make use the entire scales of the four core OAS criteria.
- 55% of all Spanish journals publishing with a Creative Commons licence use CC-BY-NC-ND, which differs from the most frequent licence of used globally, CC-BY.
- During the last two years Spanish journals have become increasingly open, both in relative share of full open access journals as well restricted access journals permitting self-archiving.
- National-level indexes, like DULCINEA in Spain which implements SHERPA/RoMEO-compliant coding of publisher-policies, could be one way of solving the persistent problem of outdated self-archiving information.
- We encourage actors overseeing multiple journals, publishers and national science policies, to make us of the the OAS as a tool for monitoring the development of openness among journals.

INTRODUCCION

Growth and increasing degree of openness in scholarly publishing

Enabled by the shift to the digital medium, the global scholarly journal landscape has been undergoing four key intertwining shifts on a global scale. The first shift is related to growth of scholarly journal publishing overall. The volume

of articles published in academic journals has been increasing steadily at a pace of 3-3.5% annually since at least over two centuries ago, and today there are over 28,000 active journals publishing over 2.5 million articles a year (Ware & Mabe, 2015). The second shift relates to the changed distribution of journal ownership internationally: a few large publishers own the majority of the journals, fueled by scholarly societies handing over publishing activities to be managed by commercial publishers (Larivière, Haustein & Mongeon, 2015). It has been this gradual infusion of profit-maximizing interests into scientific communication that has caused critique for the current circumstances. The third shift is the growth in the share of scholarly journals that publish research articles openly on the web. According to the most recent wide scope study there were at least 9,512 full open access (OA) journals publishing a total of 482,361 articles (Crawford, 2015). The fourth and final shift is the changed role of the journal publishers, which publication of a specific article used to mean the beginning and end of disseminating research results. While journals are still used as the primary publication outlet for research, authors of articles published in subscription-access journals now commonly have the possibility to independently disseminate their own manuscript of the article on other web locations as authors usually retain at least some self-archiving rights (Laakso, 2014). Archambault *et al.* (2014) found that around half of all recently published articles in scholarly journals could be retrieved for free through the web in some form, through a mix of OA journal publishing, author self-archiving, and other mechanisms uncategorized in the study.

Despite these shifts being highly important by actively shaping the practical field of scholarly communication, there has been a persistent lack of standardized tools and measurement methods to study the degree of openness in scholarly journal publishing on regional and global scales. Though there are individual measurements and estimations, as the one´s referenced in the previous paragraph, many studies fail to incorporate how much of the emerging openness in science is actually supported by sustainable policies rather than enabled by breaches of copyright. An initiative to remedy the lack of proper measurement tools has been supported by SPARC (Scholarly Publishing and Academic Resources Coalition), PLOS (Public Library of Science), and OASPA (Open Access Scholarly Publishers Association) which in 2015 resulted in the Open Access Spectrum (OAS) (SPARC, 2015). A recent article (Chen & Olijhoek, 2016) documented the history of the OAS as well as described the methodology and experiences from scoring the initial batch of over 1,000 journals which openness information was manually entered into a database accessible through a public website, the Open Access Spectrum Evaluation Tool (OASET) (oaspectrum.org 2016).

The objective of this article is to build upon the existing research available about access and rights issues in scholarly journals by utilizing Spanish journals as the population and empirical material. The OAS and the numerical scoring developed by OASET will be used as a framework to gauge the level of openness in Spanish journals, enabling easily replicable future comparison studies for the same population of journals in the future or to journals from other countries. To guide the study, two main research questions have been defined.

1. (RQ1) What is the current composition of Spanish scholarly journals? This includes a descriptive look at:
    - Types of publishers.
    - Distribution across research areas.
    - Proliferation of publishing and access models.

2. (RQ2) What is the current degree of openness in Spanish scholarly journals as per the criteria of the Open Access Spectrum Evaluation Tool? This includes establishing the values for the following variables and evaluating them as per the OAS/OASET:
    - Reader rights
    - Author posting rights
    - Copyright ownership
    - Reuse rights
    - Automatic posting (not measured as not significantly applicable)
    - Machine readability (not measured as not significantly applicable)

The article is structured as follows. Next is a brief review of relevant previous research that has laid the foundation for the current study. That is followed by the methodology section that documents the data collection and coding methods. After that the results and discussion section reviews the insights derived from the study, including the answers to the stated research questions. The article ends with a summary which also outlines the potential avenues for research and practice.

Previous research

The scope of this study is broad as it is concerned with providing a detailed snapshot of the entire Spanish scholarly journal publishing landscape (journals which report the country as their registered publisher location). This section provides a review of the most relevant existing research which concerns studies on adoption of OA publishing models, retained author-rights, copyright ownership, publishing licences, and previous studies on the Spanish journal landscape.

Reader rights

Reader rights in this context is used synonymously to readers being granted access to articles at the journal webpage, and what kind of (potential) limitations are related to such access. Of the four OAS variables included in this study this is certainly the one that has garnered the most attention in practice and research so far. As the introduction alluded to there has been strong growth in the number of full OA journals (Crawford,2015), and evaluated by established citation indicators the quality of full OA journals has been increasing and such journals are already among the high-ranking ones in Life Sciences and Medicine (Gumpenberger, Ovalle-Perandones & Gorraiz, 2013). However, reader rights/access to read is not something that is either on or off, but can be something in between, as also indicated by the OAS variable in question. There are many subscription-access journals that make their articles free to read after a set embargo period, e.g. 6 or 12 months, so-called delayed OA Laakso and Björk, 2013). Alternatively not all articles in a journal are free to read, only some. Most subscription-based journals from the major publishers offer the option for authors to publish their individual article OA in exchange for a one-time fee, so-called hybrid OA journals. A recent development with regards to hybrid OA has been organizations subscribing to journals from a publisher also getting a quota or full compensation for hybrid OA fees which can be assumed to have increased the uptake in recent years and particularly so in the future, so-called offset-agreements (see e.g. JISC, 2016).

Author posting rights

Author rights have been studied from several perspectives. The major differentiator between studies has been on emphasizing either the publisher or journal level of analysis or also expanding to take into account the article volume published in the included journals in order to enable an article-level analysis which better takes into account the size differences between journals.

A journal-level study looked at journals included in Scopus, Sherpa/RoMEO, and DOAJ found that only 32 % of journals had an explicit policy allowing green OA posting (Miguel *et al*., 2011). Higher proportions of European (37.4 %) and North American (34.7 %) journals allowed green OA (i.e. self-archiving), while smaller shares were measured for Asia, Africa and Oceania (ranging from 15.5% to 16.2%), and Latin America (0.4%). The study tells more about the (at least then) poor state of available information in particular SHERPA/RoMEO than about publishers being restrictive since lack of information was interpreted as not being allowed. Singson et al (2015) studied self-archiving and licensing clauses of 132 DOAJ-registered OA journals within library and information science through the SHERPA/RoMEO database and by visiting the journal websites. The authors noted that a drawback of SHERPA/RoMEO is that it is updated infrequently and unevenly, which highlights the need to consult other sources for comprehensive self-archiving and licensing information. Avoiding use of SHERPA/RoMEO altogether, Laakso (2014) conducted an analysis of copyright agreements of the 100 largest scholarly journal publishers in Scopus (by annual article volume) by visiting journal websites which revealed that over 80% of all published articles globally could be made available on institutional repositories as accepted manuscripts after 12 months of original publication (Laakso 204).
A country-specific scholarly journal overview incorporating analysis of retained author-rights like the one aimed at in this study has at least been done in France (Dillaerts & Chartron, 2013). The authors conduct an analysis of self-archiving policies of journals included in the French national Héloïse index (Heloise.ccsd.cnrs.fr 2016), which initiation was inspired by the Spanish DULCINEA index (accesoabierto.net 2016), which will be the focus of the study in this article. Of the 32 publishers with a total of 299 journals in Héloïse, 88% of all journals allow self-archiving of some version of a published article (as per March 2013) (Dillaerts & Chartron, 2013). Section 1.2.5 is dedicated to describing previous studies on the Spanish scholarly journal landscape specifically, which also includes studies on author posting rights.
Gadd and Troll Covey (2017) provide the most recent study which is a longitudinal analysis covering years 2004-2015 of the publisher policies of the 107 publishers that were first entered into SHERPA/RoMEO in 2004, which included many of the large global publisher. While the authors found that while a higher proportion of publishers now explicitly are coded

'green' i.e. allow some form of self-archiving, the conditions for doing so (how, where, when) have been defined and restricted to a very high degree. The authors found that as publishers introduced paid OA options self-archiving restrictions among publishers increased.

Copyright ownership

The issue of copyright ownership remains with full OA journals, and could be argued to require even more focus as issues such as reuse and redistribution need to be clearly defined for at least authors, the publisher, and the general public. Hoorn and van der Graaf (2006) reviewed the various approaches to copyright ownership OA journals have adopted, as well as survey authors of articles published in full OA journals within biomedicine on their opinions on copyright transfer. The survey results mainly show that rights-management is a complex issue with divisive answers to many of the questions relating to commercial exploitation and re-use of published contents.

Ludewig (2014) studied the copyright and OA landscape among scholarly journals in Mediterranean Europe (France, Greece, Italy, Portugal, Spain and Turkey) through a survey answered by 187 publishers in 2012. 110 out of 174 (63.2%) publishers did not require their authors to sign any copyright agreement, and 19 out of 174 (10.9%) publishers only required authors to transfer just a non-exclusive right to publish the article. Based on the results Ludewig (2014) concluded that research publishers based in Mediterranean countries have, on average, very OA-friendly copyright and self-archiving policies in place.

Reuse rights

Which licence is most beneficial for the progress of science while also acknowledging the interests of individual authors and publishers is something that is still actively debated (see e.g. Graf &Thatcher, 2012; Morrison & Desautels, 2016) and where many different practices exist among publishers. Relatively little has been researched into this aspect, likely due to the fact that the practice of permissive licences is still emerging and aggregated information is not readily available. Schlosser (2016) recently reviewed the copyright information of 385 journals from 83 library publishing programs in the US, coming to the general conclusion that there is still a lot of room for improvement in presentation and consistency in how copyright information is presented in journals and individual articles.

For insight into what licences full OA journals use the most comprehensive and up to date information is available from the DOAJ. Based on figures from May 31st 2016, over half of the journals registered to the DOAJ (doaj.org 2016) had reported having a Creative Commons licence, most with a CC-BY, CC-BY-NC, or CC-BY-NC-ND licence. Table 1 presents a breakdown of individual licenses, or lack thereof, both as a share of journals and calculated as a share of article volume for the year 2015.

Previous studies on the Spanish scholarly journal landscape

A previous study of Spanish scholarly journals (Melero *et al*., 2014) provided an analysis including research areas, types of publishers, subscription/OA, and self-archiving right data extracted from the DULCINEA database in October 2013. The DULCINEA database is an index containing active scholarly Spanish journals, including identification data, type of access, self-archiving and licensing policies, and classifies journals in accordance with the SHERPA/RoMEO colours taxonomy (sherpa.ac.uk 2016).

Spain has a government mandate for making publications stemming from publicly funded research available OA within 12 months of publication since July 2011. Borrego (2015) evaluated the effectiveness of the mandate two and a half years after its implementation in the first quarter of 2014 by taking a random sample of articles from the Web of Science mentioning the Spanish Ministry of Science and Innovation in the grant information. 478 (58.4%) of 818 articles could be found OA online in some form, which is fairly close to the figure of around 50% global OA presented by Archambault et. al (2014), suggesting that the OA mandate compliance was still lacking as most countries do not have a national-level OA mandate in place. However, having an OA mandate in place creates long-term demand for compatible publication outlets and transparent rights information. In this sense, directories such as SHERPA/RoMEO or DULCINEA can help authors, librarians and repository managers to check reuse rights and self-archiving allowance journal policies.

Torres-Salinas et al (2016) conducted a longitudinal study of the research output of researchers affiliated with Spanish institutions from by using Web of Science (WoS) data covering years 2005-2014. The authors discovered a persistent

trend that Spanish authors proportionally publish more in full OA journals than the global average. The global average for 2014 was 10% of articles published in full OA journals while Spanish authors published 13% of their articles in such journals. The increase of 2-3% was persistent during the observed timespan. An analysis of average category-normalized impact placed Spanish research output available OA (articles that can be found in a variety of journal types, ie. full OA, embargo, hybrid...) below the global average for all observed years. The fact that most of these articles are published in national, Spanish-language, low impact journals explain these results, according to the authors

METHODOLOGY

Descriptive analysis

In addition to updating the previous dataset (Melero *et al*., 2014) chronologically (core journal data for this study extracted from DULCINEA on December 2015), this study adds three important new dimensions to the analysis: rights owner, type of CC licence and detailed self-archiving data (what version of a manuscript can be uploaded when, not simply a yes/no variable). A descriptive statistical analysis by journal subject, type of publisher, copyright holder and CC licenses is also conducted. Table 2 displays all data variables and their options.

Measuring the degree of openness

To evaluate the degree of openness of journals we used four categories from the HowOpenIsIt Guide [SPARC 2015] and the scales used by the Open Access Spectrum Evaluation Tool (oaspectrum.org 2016). We excluded "Automatic posting" and "Machine readability" categories from the analysis, because it is difficult to find journals in our population that specify those issues in their websites, and very few journals in our study would meet any of those criteria. Taking this into account the omitted categories the max score is 72 points. To avoid duplication of evaluation criteria for each category and scoring, a full figure containing both such information and the placement of Spanish journals in the framework is presented as part of the results section (Section 3.7).

Statistical analysis tool and methods

SPSS statistical package v.23 by IBM was used for all analysis. Crosstabs tables were grouped by subject, type of publisher, copyright holder, and CC license, and applied Chi-squared test to evaluate potential associations or dependence among groups. Spearman's correlation factors were calculated to measure the strength and direction of associations between variables.

RESULTS AND DISCUSION

This section provides the results of the study by first presenting a comparison to the most directly comparable previous study of Spanish journals (Melero *et al*., 2014), then focusing in-depth on the completely new data and variables introduced as part of this study, and finally concludes by applying the OAS framework to the population in order to provide a standardized evaluation of the openness of Spanish journals. In order to give a high-level descriptive overview of the data as well as how the Spanish journal landscape evolved during the time of over two years between the studies, Table 3 compares the new results those of the previous study on the DULCINEA database (Melero *et al.*, 2014). The most notable changes during the last two years relate to: the type of access (the percentage of restricted access journals has decreased), the specification of rights has increased, and there has been an increase in the share of journals allowing self-archiving (from 65% to 72.6%) which is directly related to the increased specification of author's rights in the journals sites (from 73 to 85%). The percentage of journals coded 'white' according to SHERPA/RoMEO criteria has remained almost the same while the proportion of journals coded 'blue' and 'green' have increased because publishers have improved specification of self-archiving policies. Regarding what version authors are allowed to self-archive, 69% of journals allow the deposit of the version of record (VOR) immediately after publication, 18% the author post-print at acceptance, 22% the pre-print at submission and almost 7% de author post-print or VOR after an embargo.

The inclusion of Spanish journals in WoS and Scopus was also measured (data from JCR 2014 and SJR 2014 Scopus, respectively). The overall coverage per discipline and index can be found in Table 4. A fourth of all Spanish journals were included in Scopus while the more exclusive WoS index only included under a tenth of all journals. Health sciences and social sciences were found to be the most well-represented areas in both indexes.

Journal subject areas and types of publishers

More than 50% of journals within the health sciences are published by Elsevier, and it is also the subject area with the more restricted journals regarding reader access. In fact, if we limit the perspective to only commercial publishers with at least 3 journals, health sciences is the subject area with the highest relative share. Elsevier represents a 68% share of journals within the health sciences.

Regarding self-archiving, health science journals are again the most restrictive ones. In more than 40 % of health science journals archiving is not allowed or allowed only after an embargo. If authors pay an optional article processing charge (APCs) to enable hybrid OA the version allowed to be deposited is the version of record, if not the accepted author's post print is allowed after an embargo. This is for example Elsevier's archiving policy.

A strong association was found between life science journals and the association or society publisher type, between humanities and social sciences journals and university or research institute publishers, and between health sciences journals and commercial publishers ($p < 0.001$). Most of social sciences (60%) and humanities journals (68%) are published by academic and research institutions, and most health sciences journals by private commercial publishers (48%) or by academic/professional learned societies (41%).

3.2. Journal subject areas and reader access

Most Spanish scholarly journals are freely accessible online (Figure 2). There is a strong relationship between health sciences journals and restricted access, and social sciences and free/gratis access ($p < 0.001$).

Around forty percent of journals published by commercial companies are freely accessible online (41%), this is possible because agreements exist between publishers and the scholarly associations or learned societies to distribute the electronic version of the journals for free. There are also free access journals after an embargo, some examples are journals published by Elsevier, expression of medical societies (*Allergologia et Immunopathologia, Medicina Intensiva, Revista Española de Medicina Nuclear e Imagen Molecular,* among others). There are also few hybrid journals most published by Springer (12) and Taylor and Francis (6), Cambridge University Press and EPI SCP (1).

Self-archiving conditions, and comparison between subject areas

The majority of journals allow self-archiving of the VOR immediately in parallel with publication of the journal article. This is quite exceptional considering that journal publishers, excluding OA journals, are highly restrictive of re-distribution of the VOR version of the article. For example Laakso (2014) calculated that only around 10% of articles published by the largest publishers in Scopus allow self-archiving of the VOR. Figure 3 provides an overview of all key document versions and when they are allowed to be self-archived at various stages of the publication process.

More than 80% of journals allow immediate archiving except health journals which permit immediately archiving only in a 42% of cases and in a 24% after an embargo.

There is a significant dependence between subject area and self-archiving allowance ($p < 0.001$) and a strong association between health sciences journals and no self-archiving permitted or permitted after an embargo, and social sciences and humanities journals with self-archiving allowance (Figure 4). This is in accordance with previous comments regarding subject and type of publisher.

Regarding RoMEO classification of journal colors (Figure 5), DULCINEA's database does not include any journal that fulfills the criteria to be classified as yellow (only pre-print is allowed to deposit). Most of total journals are blue (60%) or green (24%). The dependence between research area and RoMEO colour was significant ($p< 0.001$) with a strong positive association between health sciences journals and white code (34% of total health journals).

Copyright holder by journal subject area and publisher type

Authors are allowed to retain copyright only in 14% of the journals, from those the percentages by discipline were as follows: Life sciences (6%), Engineering+Physics+Maths 5%; Humanities 35%; Health Sciences 6%, and Social sciences 48% (Figure 6).

Although we assigned a unique category when authors were stated as the copyright holders, we found out different ways to express this assignment:

"Authors retain copyright and grant the journal the right of first publication"
"Authors retain copyright and grant the journal right of first publication with the work simultaneously licensed under a Creative Commons Attribution"
"The authors hold copyright"
"The authors transfer to the journal the right–not exclusive–to reproduce and distribute the article"
"The authors hold copyright and assign the publisher the exclusive right to distribute the paper for one year after publication"
"The publisher when the access is by subscription. The authors when they pay APC"
"The Society, however authors can request to hold the copyright and grant a publication"

Association between subject area and copyright holder was found to be significant ($p< 0.001$) and the strongest positive associations were between health sciences and commercial publishers, and humanities and Univ/Res. Inst publishers. It is worth noting that some societies or professional associations have journals published by commercial publishers but do not meet commercial copyright policies because the society is the owner of the journal and determine its own policy, this is the case of *Anuario de Psicología Jurídica* published by Elsevier, this journal is gratis and the authors transfer the copyright to *Colegio Oficial de Psicólogos de Madrid.* Another example of an open access journal published by a commercial publisher (Springer) is *SERIEs,* Journal of the Spanish Economic Association, in this example the Association sponsors APCs and papers are distributed under a CC licence BY-ND, and authors can retain the copyright and assign Springer only the exclusive right to any commercial use of the article. For the journals published by universities or any other type of publisher, almost 100% authors transfer the copyright to the institution (Figure 7).

Copyright holder, reader access and self-archiving

A significant dependence was found between copyright holder and type of reader access ($p< 0.001$, Figure 8) and the strongest positive associations were found between authors (owners) *x* gratis, commercial publishers *x* restricted access, and academic publisher (Univ/Res.Inst) *x* gratis. This finding is in agreement with the fact that most journals published by commercial publishers are restricted to subscribers and authors transfer their copyright rights.

Regarding self-archiving there was a dependence between who the copyright owner is and self-archiving allowance ($p< 0.001$, Figure 9). When authors retain copyright they obviously do not need permission from a third party to reuse the material. Professional associations and commercial publishers are the copyright holders more reluctant to allow self-archiving. However, self-archiving is allowed by most journals published by universities where they own the copyright, mainly the publishers VOR.

With respect to colours of journals according ROMEO's taxonomy, most of Spanish journals are blue (60%, Figure 9). The relationship between colour and copyright holder was significant ($p< 0.001$) and the strongest associations were between authors as copyright owners *x* green colour journals, academic publishers *x* blue colour, and commercial publisher and learned societies *x* white journals.

Creative Commons licenses across publisher types and reader access

A total of 643 journals in the population use a CC license, with BY-NC-ND being the preferred one (55% of all journals publishing with a CC licence, Figure 10), followed by CC BY and CC BY-NC. The relationship between license and subject was not found to be significant ($p > 0.05$). From the total population of journals using a CC licence the order by use of any CC license was: Social sciences (53%), Humanities (30%), Health sciences (8%), Life sciences (6%), and Engineering+Physics+Mathematics (4%). Licenses which exclude the condition of no commercial use were found to be scarcely used, likely due to publishers guarding against third parties reusing published papers for profit.

A strong relationship was found between type of license used and type of publisher ($p < 0.001$). The use of CC licenses by type of publishers was as follows: Univ./Res.Inst (67.2%), Asoc/Soc (22.1%), Commercial (6.8%), Governmental (3.9%). 93% of the journals that use CC licenses are gratis, 6.5 % are gratis after an embargo and 0.3% are restricted to subscribers but authors have the open choice option (as do some journals published by Springer, for instance *Revista Matemática Complutense, Qualitative Theory of Dynamical Systems, Securitas Vialis*. *Revista Europea de Tráfico*, *Transportes y Seguridad Vial*).

Regarding the type of licence and who is the copyright holder, the statistical analysis showed that there is a relationship between the type of license and the owner of rights ($p < 0.001$). In 319 (49.6%) out of 624 journals using CC licenses, the copyright holder was the university or research publisher, in 23% was the authors, Society/Asoc. 19.6%, commercial publisher 4.8%, and governmental organizations 3.0%. When journals use CC BY authors are mostly the owners of the rights (51%) followed by private publishers. Spearman's correlation analysis revealed significant correlations among those ordinals variables (access, CC license and RoMEO colour). CC licences were ordered from CC BY (1) to CC by-NC-ND (6), access from free access (1) to restricted access (3), and RoMEO colours from white (1) to green (4). Taking this in consideration there is a positive correlation between access and CC licence (both variables increase and decrease in parallel) and negative between CC license and RoMEO colour.

Open Access Spectrum analysis

In this analysis the OAS spectrum with the quantitative scores defined by the OASET are applied to the context of all Spanish journals listed in the DULCINEA database.

Figure 11 summarises number of journals complying with the options of the OAS for the first 4 categories. From the total journals (1728), 1285 (74.5% received max score of 20 in reader rights). Of these 1285, 187 did not permit any reuse, and a 2.1 % share constituted mostly of journals published by Elsevier allow some reuse of the reviewed post-print after an embargo and under the license CC By-NC-ND. Elsevier policies for Spanish journals have changed several times during the last years, in fact, recently they have converted some journals from restricted to a hybrid model: *Revista Internacional de Acupuntura, Gastroenterología y Hepatología, Clínica e Investigación en Ginecología y Obstetricia, Enfermería Clínica, Revista Médica de Homeopatía, Medicina Clínica, Medicina Intensiva, Psiquiatría Biológica, Revista Clínica Española, Revista de Logopedia, Foniatría y Audiología,and Vacunas: Investigación y Práctica*. Most Hybrid journals besides the former ones are also published by commercial publishers: Springer (12), Taylor and Francis (7) and the rest by small independent private publishers.

Adding up the points for each individual journal, Figure 12 shows a histogram of the whole scores (in percentages of the maximum of 72 points total per journal) with a median of 55.6 and a mean of 52.1. 68% of journals have scores equal or higher than 50%.

Most journals (86 %) ranked within the fourth quartile (Q4) are published by universities or research institutions. Journals with a total score of zero (11.5%) correspond to journals that are restricted to subscribers and there is no information about reuse and/or depositing rights on their websites. The distribution of the OAS score is not the same across subjects ($p < 0.05$) because subject, type of publisher and access type are related, as revealed in previous analysis. 662 out of 1285 journals received a perfect score of 20 in reader rights, however those journals (38% of total) do not allow any reuse beyond fair used (Table 5) or any other limitations or exceptions (all rights reserved). The rest use different licenses from CC BY-NC-ND (388, 22.5%) till CC-BY (133, 7.7%).

Sixty one (3.5%) out of 1285 journals received the perfect score of 16 in copyrights (authors hold the copyrights). Of these 1285, 1039 are gratis and publisher grants broad rights (Table 6).

Author posting rights are directly related to the colour of journals, since the colour indicates what version of papers can be used to deposit in an institutional or subject repository. Journals rated zero in posting rights coincide with white journals plus those that are still ungraded because the lack of information about archiving policies.

Table 7 maps out how reader rights match up to posting rights. 64% of journals have a perfect score of 20 in readers'rights (i.e. post all their content OA on the web immediately) and also allow posting at least one version of the paper (preprint, author post print or version of record) with or without conditions.

CONCLUSIONS

Comparing the results of this study to those obtained in 2013 (Melero et al, 2014) it can be concluded that awareness of communicating reuse and posting rights has improved among journals, copyright terms are more accurately expressed and easier to locate, and the use of CC licenses has gained increasing adoption. Comparing the CC licence version distribution of Spanish journals to those of all OA journals listed in the DOAJ (Table 1) it is clear that Spanish journals are more restrictive by most having a CC BY-NC-ND rather than the CC-BY which is the most popular licence among journals in the DOAJ both measured by number of journals and number of published articles. Nevertheless, the landscape of Spanish scholarly journals is mainly open, with more than 70% of journals freely accessible to readers. If we contrast reader rights to posting rights, 64% of journals are gratis and allow deposit of some version of articles, this percentage represent those periodicals that meet the widely recognized BOAI definition of open access (budapestopenaccessinitiative.org 2016). On the other hand, when contrasting readers' rights against reuse rights the percentage is lower (36%), however this is a consequence of the division of reuse and posting rights in the OAS. In reality there is an intersection between both rights when the authors become users but also have the right to post their works.

Regarding the type of publisher and research areas, the largest number of journals are concentrated to the social sciences and humanities, followed by health sciences. The former are mainly published by higher education and research institutions, and the latter by commercial publishers or learned societies or professional associations which in some instances have agreements with private publishers to distribute their publications. The fact that social sciences and humanities journals as well as non-English language journals are underrepresented in the mainstream journal indexes WoS and Scopus is known (Mongeon and Paul-Hus, 2016). It can be speculated that mainstream journal indexing services have favoured journals published in their own country, region, or corporate product portfolio in order to increase their visibility in the publishing market.

There are challenges involved in collecting and curating data over journal policies on a global scale, whether talking about SHERPA/RoMEO or the OASET. Even by having the DULCINEA database as a starting point we encountered similar challenges as those stated by Chen and Olijhoek (2016): editorial policies are not easy to find and sometimes they are not even on the web; they change and editors do not alert aggregators about changes, this makes it difficult to maintain records of updated data; there are also inconsistencies about rights permissions, and use of open license, examples of journals with the legend of "all rights reserved" and then "This work is licensed under a Creative Commons…" (see for instance *Pharmaceutical Care*). When discovered, DULCINEA administrators alert journal publishers or editors to amend this kind of contradictions, but changes are not always made immediately or publishers do not respond at all.

On a global scale the situation for journals reporting access and rights is still unresolved. The OAS and the OASET are valuable initiatives to help increase availability and accuracy of such information in a standardized way. This study is the largest practical implementation of the OAS, studying not only an individual outlet but a large cohort of journals, and the only study incorporating a complete national population of journals. National indexes of journal editorial policies are still rare, and without the data in DULCINEA it would not have been possible to conduct this study. The long-standing problem of SHERPA/RoMEO has been infrequent updates to ever-changing journal policies, and a lack of clear responsibility for submitting information and updates. By decentralizing journals to the national level, but still retaining RoMEO-compliant coding and data structures, there is a much more manageable population to curate.

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Table 1. Breakdown of journal licences for journals included in the DOAJ as per May 31st 2016.

Journal Licence	Journal Count	%	Article Count	%
CC BY	2 977	33.5 %	98 685	43.5 %
CC BY-NC-ND	1 280	14.4 %	29 349	12.9 %
CC BY-NC	1 062	12 %	25 731	11.3 %
CC BY-NC-SA	374	4.2 %	14 451	6.4 %
CC BY-SA	170	1.9 %	5 370	2.4 %
Publishers own license	87	1 %	664	0.3 %
CC BY-ND	52	0.6 %	1 014	0.4 %
Not CC-like	42	0.5 %	435	0.2 %
No licence	8	0.1 %	138	0.1 %
Publisher's own license agreement	2	0 %	0	0 %
No licence information available	2825	31.8 %	51 680	22.8 %
Total	8 879	100	227 067	100

Table 2. Variables and options used to describe journals.

Variable	Possible values
Subject	Life sciences, Engineering+physics+maths, Humanities, Health Sciences, Social sciences
Type of Publisher	Society/Association/Learned Assoc, Commercial publisher, Governmental organization, Universities/Research Institutions
Type of Access	Gratis, Gratis after embargo, Restricted to subscribers with or without OA choice
Rights specification	Yes, No
Self-archiving permission	Not allowed, Allowed after embargo, Allowed, Unknown
RoMEO Color	White, Blue, Green, Unknown
Type of CC licence:	Creative Commons Attribution, Creative Commons BY-ShareAlike, Creative Commons BY-NoDerivativeWorks, Creative Commons Attribution-Noncommercial, Creative Commons BY-Noncommercial-ShareAlike, Creative Commons BY-Noncommercial-NoDerivativeWorks
Copyright holder	Authors, Governmental Organization, Commercial publisher, Society/Association/Learned Assoc, and Universities /Research Institutions

T**able 3**. Relative shares of Spanish journals compared to data as of 2013 (Melero *et al.*, 2014).

	% in 2013 n= 1628	% in 2015 n= 1728
Subject		
Life sciences	6.5	6.4
Engineering+physics+maths	4.5	4.3
Humanities	24	25.8
Health Sciences	20	18.0
Social sciences	44.5	45.5
Type of Publisher		
Society/association/learned assoc	29	27.4
Commercial	17	16.3
Governmental	6	5.7
Univ./Res.Inst	48	50.6
Type of Access		
Gratis	71	74.4
Gratis after embargo	11	11.3
Restricted to subscribers +- OA choice (Hybrid OA)	18	14.4
Rights specification		
No	27	13.5
Yes	73	86.5
Use of CC licenses	21	37.5
Self-archiving allowance		
Not allowed	15	15.5
Allowed after embargo	No data	6.8
Allowed (yes)	65	72.6
Unknown	21	5.2
ROMEO Color		
White	15	15.5
Blue	52	56.6
Green	12	22.7
Unknown	21	5.2
Type of CC licence		
Creative Commons Attribution	No data	21.2
Creative Commons Attribution-NoDerivativeWorks	No data	0.6
Creative Commons Attribution-Noncommercial	No data	16.2
Creative Commons Attribution-Noncommercial-NoDerivativeWorks	No data	54.7
Creative Commons Attribution-Noncommercial-ShareAlike	No data	6.7
Creative Commons Attribution-ShareAlike	No data	0.6
Copyright holder		
Authors	No data	14.0
Governmental Organization	No data	5.1
Commercial publisher	No data	10.9
Society/association/learned assoc	No data	29.1
Universities /Research Institutions	No data	40.8

Table 4. Indexing coverage of Spanish journals.

	N	%Total	Life Sciences	Engineering-Physics-Mathematics	Humanities	Health Sciences	Social Sciences
Scopus	432	25.0%	8.3%	7.6%	17.4%	30.8%	35.9%
WOS	166	9.6%	10.8%	10.8%	18.7%	27.1%	32.5%

Table 5. Crosstabulation of reader rights by reuse rights.

			Reuse rights OASET score					
			Reuse 0	Reuse 4	Reuse 7	Reuse 14	Reuse 20	Total
Reader rights OASET score	Reader0	Count	187	0	37	0	0	224
		(% of Total)	(10.8%)	(0.0%)	(2.1%)	(0.0%)	(0.0%)	(13.0%)
	Reader5	Count	0	25	0	0	0	25
		(% of Total)	(0.0%)	(1.4%)	(0.0%)	(0.0%)	(0.0%)	(1.4%)
	Reader12	Count	103	0	37	2	3	145
		(% of Total)	(6.0%)	(0.0%)	(2.1%)	(0.1%)	(0.2%)	(8.4%)
	Reader16	Count	31	0	14	4	0	49
		(% of Total)	(1.8%)	(0.0%)	(0.8%)	(0.2%)	(0.0%)	(2.8%)
	Reader20	Count	662	0	388	102	133	1285
		(% of Total)	(38.3%)	(0.0%)	(22.5%)	(5.9%)	(7.7%)	(74.4%)

Table 6. Crosstabulation of reader rights by copyrights.

			Copyright OASET score				
			Copyright 0	Copyright 4	Copyright 10	Copyright 16	Total
Reader rights OASET score	Reader0	Count	137	0	81	6	224
		(% of Total	(7.9%)	(0.0%)	(4.7%)	(0.3%)	(13.0%)
	Reader5	Count	0	25	0	0	25
		(% of Total))	(0.0%)	(1.4%)	(0.0%)	(0.0%)	(1.4%)
	Reader12	Count	51	0	89	5	145
		(% of Total)	(3.0%)	(0.0%)	(5.2%)	(0.3%)	(8.4%)
	Reader16	Count	9	0	38	2	49
		(% of Total)	(0.5%)	(0.0%)	(2.2%)	(1%)	(2.8%)
	Reader20	Count	185	0	1039	61	1285
		(% of Total)	(10.7%)	(0.0%)	(60.1%)	(3.5%)	(74.4%)

Table 7. Crosstabulation of reader rights by posting rights.

			Posting rights OASET score					
			Posting 0	Posting 4	Posting 6	Posting 10	Posting 16	Total
Reader rights OASET score	Reader0	Count (% of Total)	136 (7.9%)	0 (0.0%)	36 (2.1%)	44 (2.5%)	8 (0.5%)	224 (13.0%)
	Reader5	Count (% of Total)	1 (0.1%)	7 (0.4%)	3 (0.2%)	2 (0.1%)	12 (0.7%)	25 (1.4%)
	Reader12	Count (% of Total)	39 (2.3%)	0 (0.0%)	27 (1.6%)	69 (4.0%)	10 (.6%)	145 (8.4%)
	Reader16	(Count % of Total)	7 (0.4%)	0 (0.0%)	9 (0.5%)	24 (1.4%)	9 (0.5%)	49 (2.8%)
	Reader20	Count % of Total	174 (10.1%)	0 (0.0%)	35 (2.0%)	810 (46.9%)	266 (15.4%)	1285 (74.4%)

Figure 1. Journal subject areas across types of publishers.

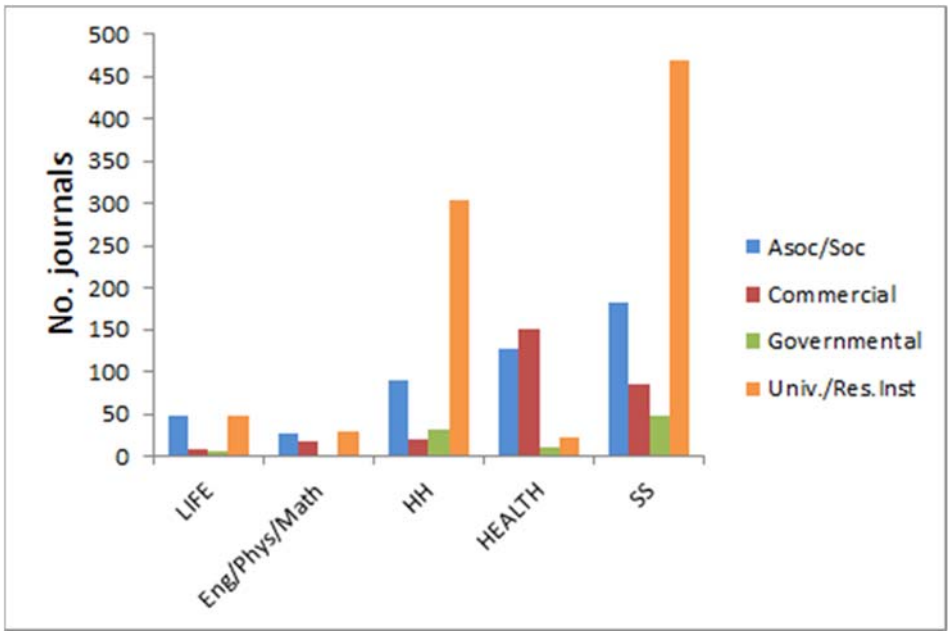

Figure 2. Type of online access by journal subject area

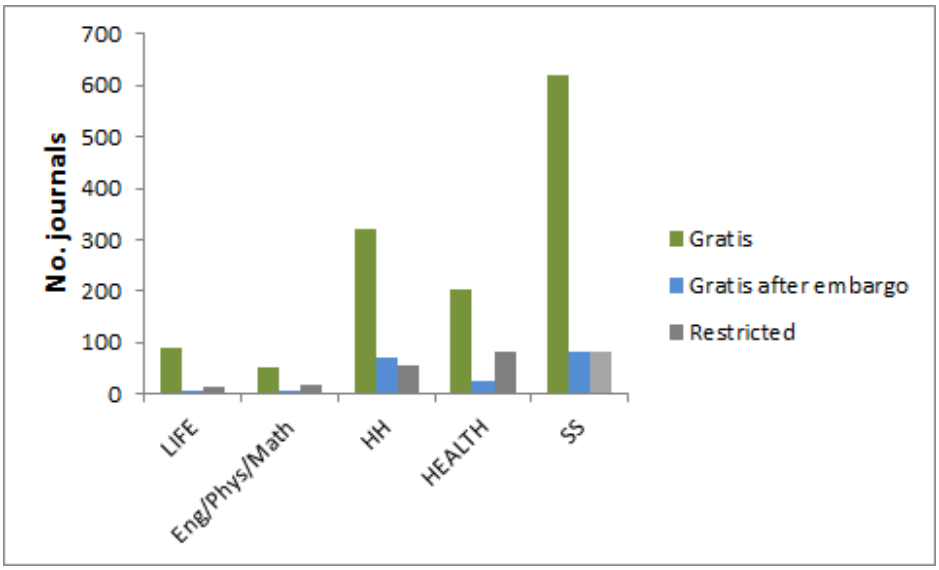

Figure 3. What article version is allowed to be self-archived and at what point in time.

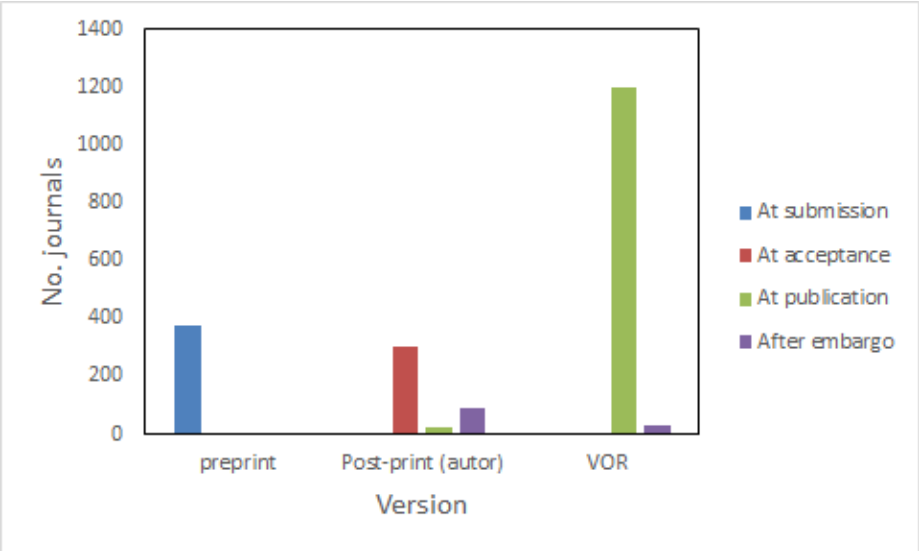

Figure 4. Self-archiving allowance by subject area.

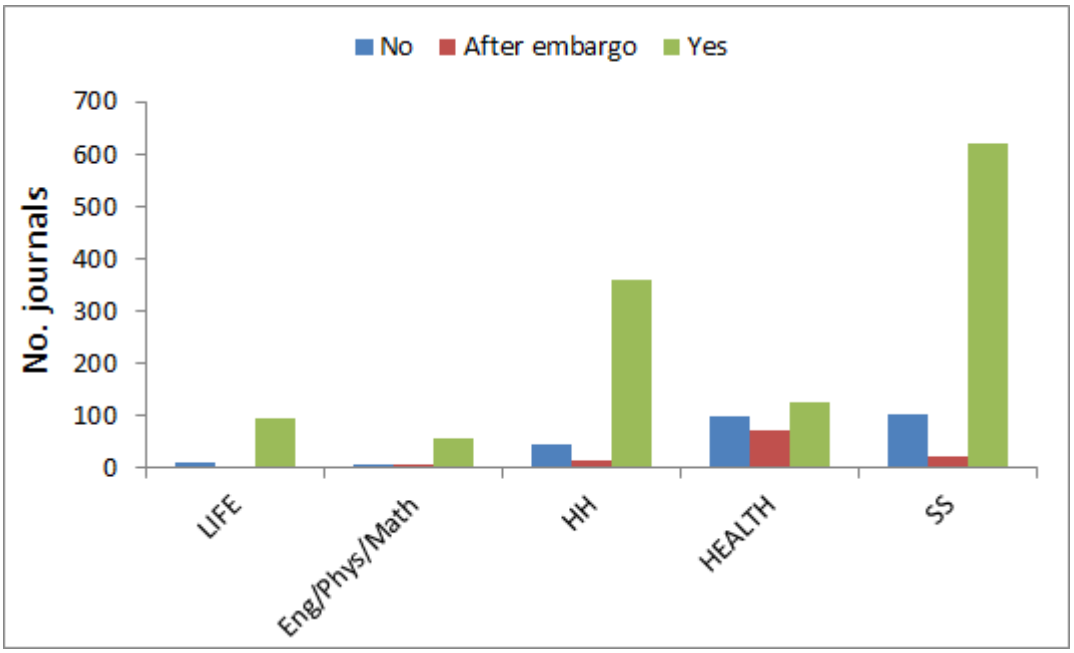

Figure 5. ROMEO colour of journals by subject.

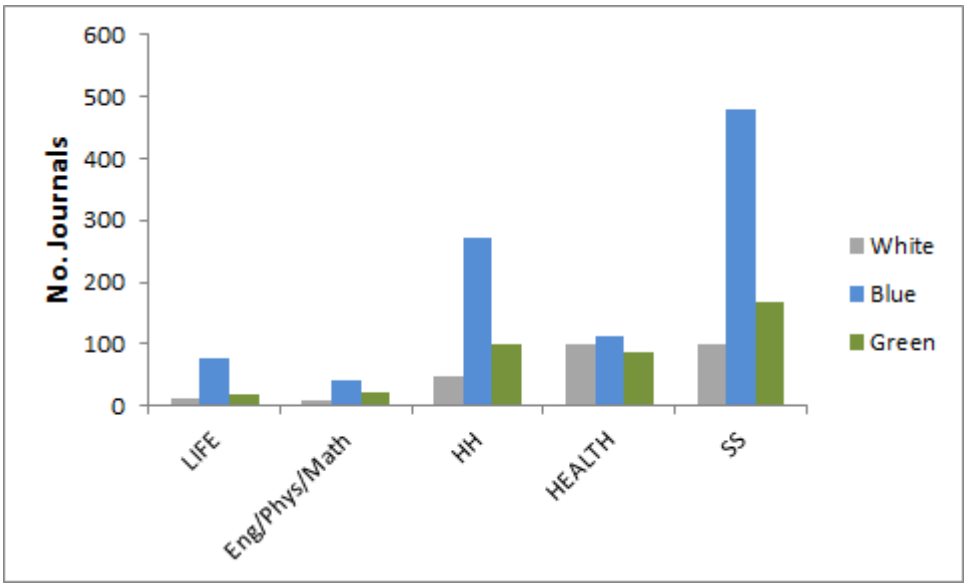

Figure 6. Journal subject area and copyright holder.

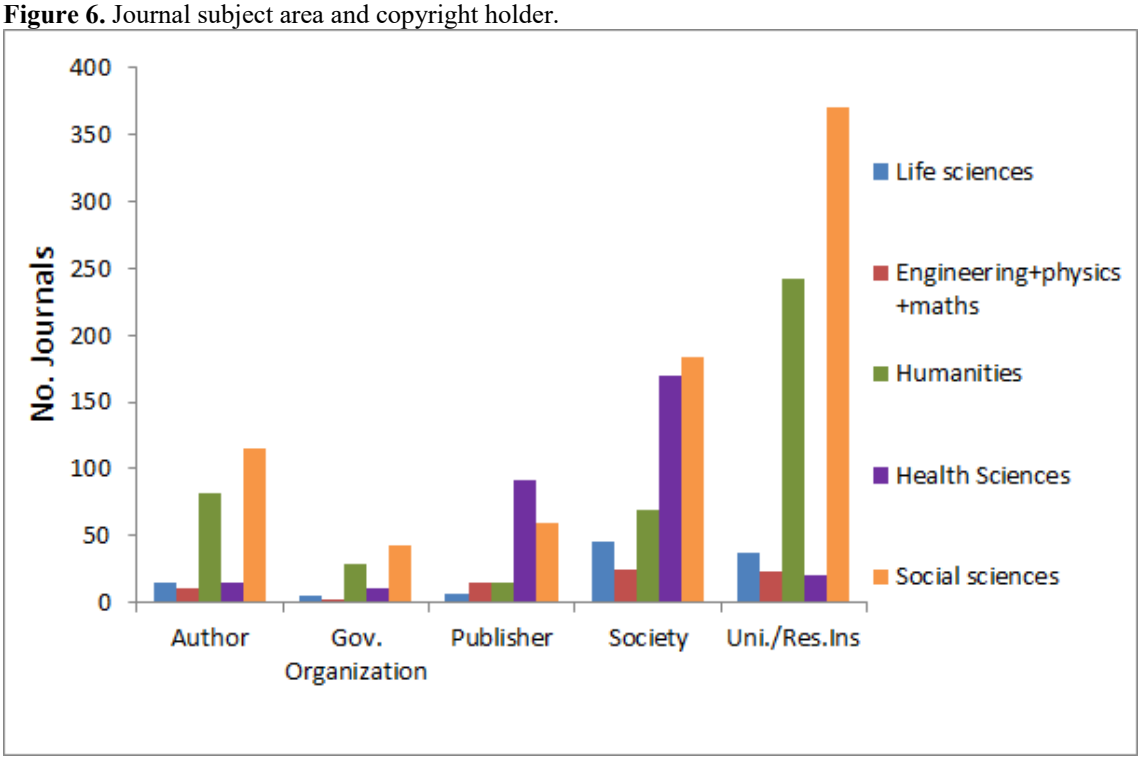

Figure 7. Copyright holder by type of publisher.

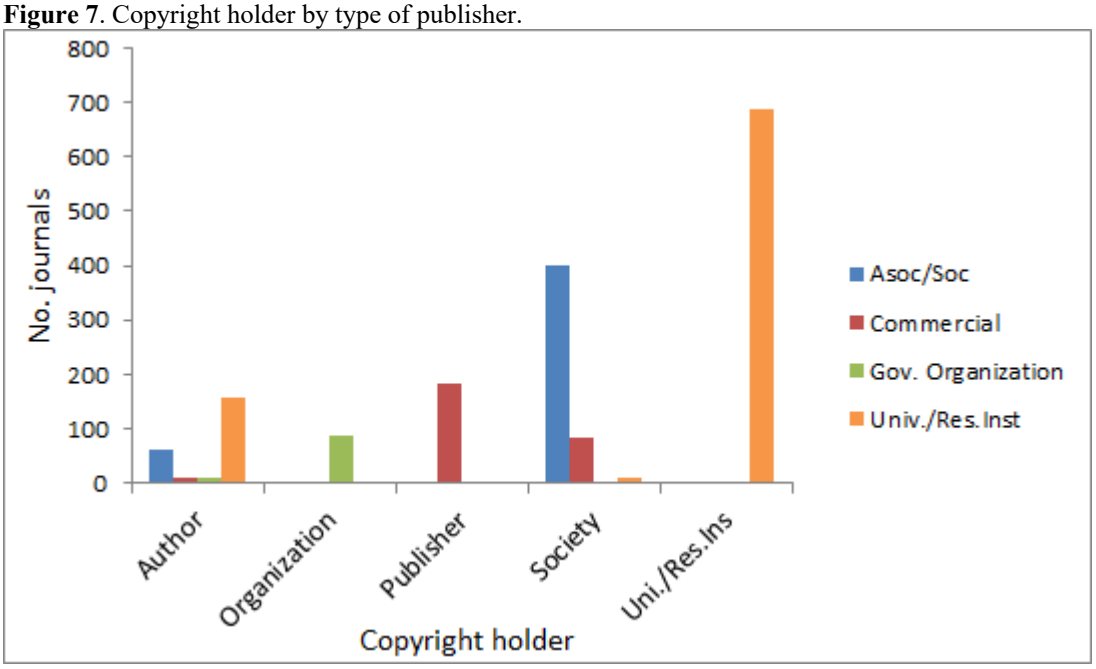

Figure 8. Copyright holder by type of access.

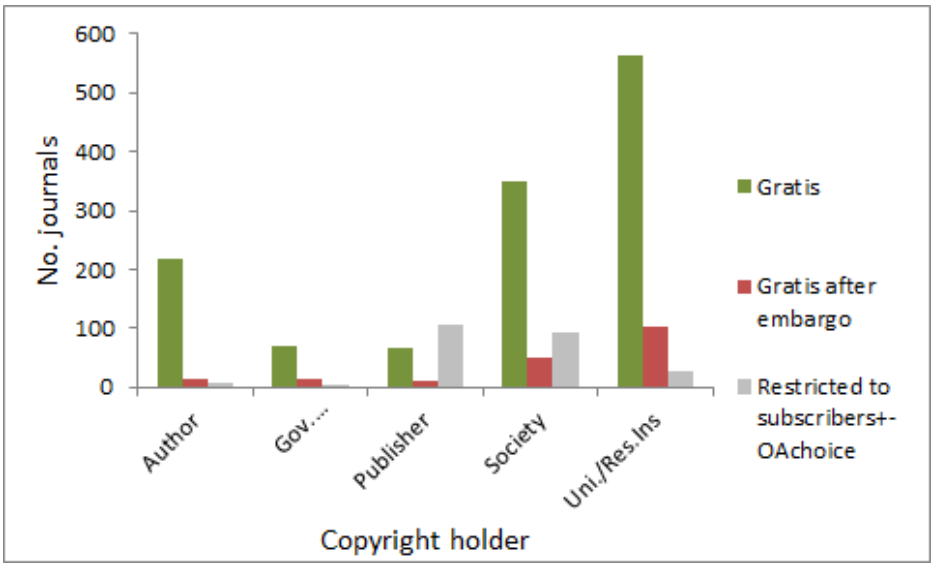

Figure 9. Copyright holder and ROMEO color for self-archiving.

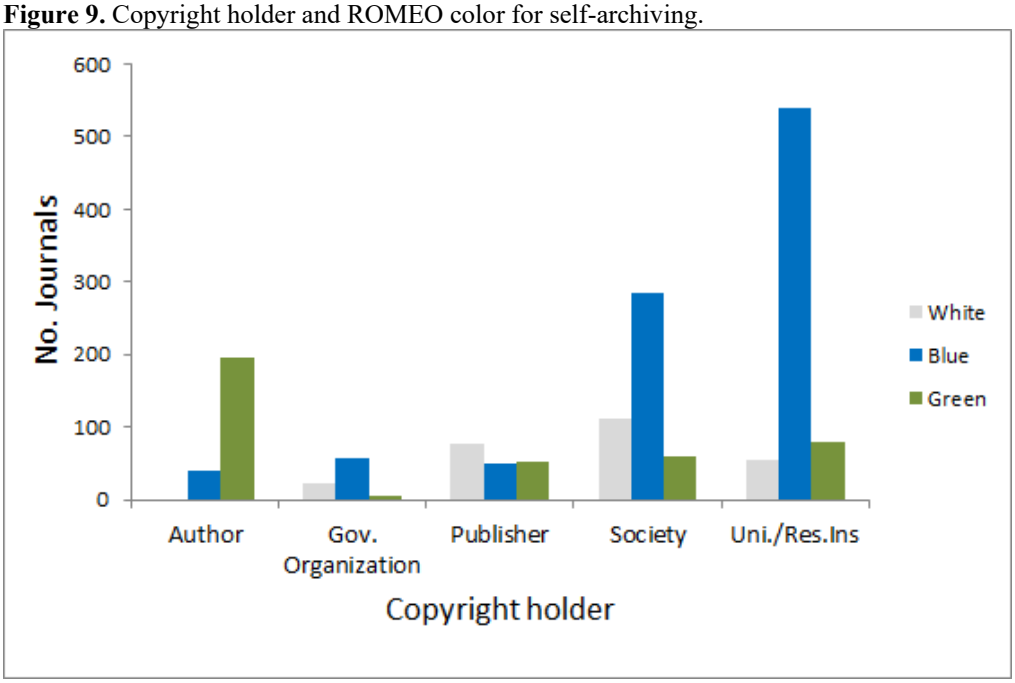

Figure 10. CC licence type per subject area.

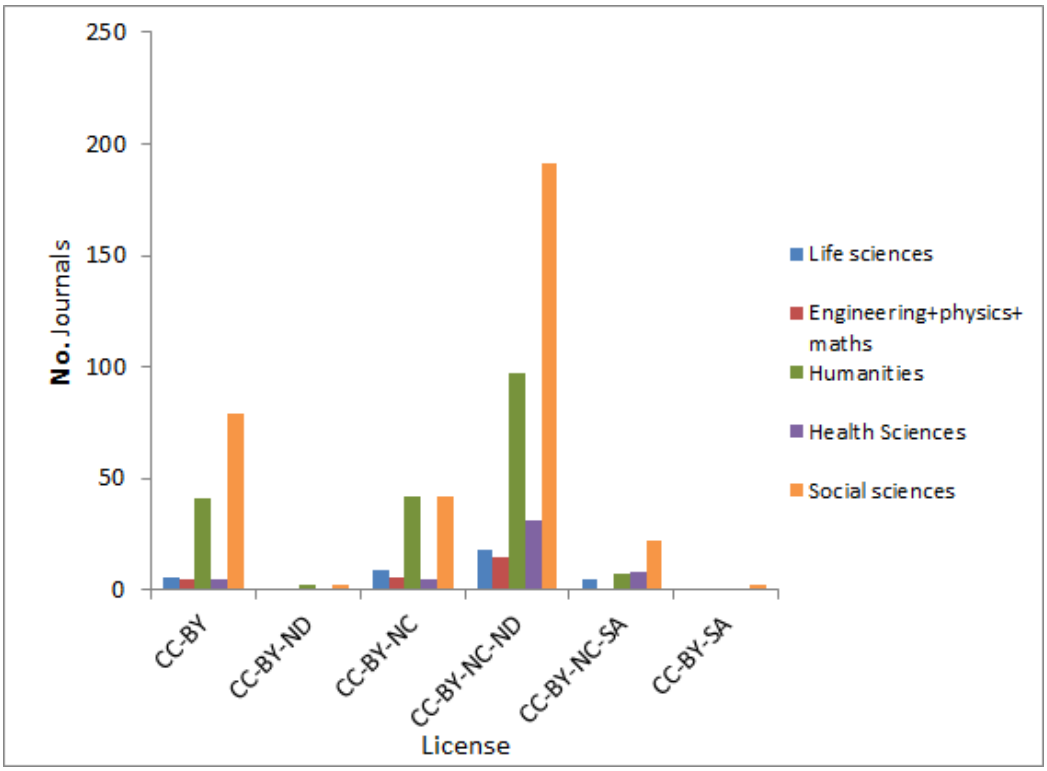

Figure 11. Open Access Spectrum Evaluation Tool score distribution of Spanish journals (in percentages of the maximum of 72 points total per journal).

ACCESS	READER RIGHTS		REUSE RIGHTS		COPYRIGHTS		AUTHOR POSTING RIGHTS	
	Free readership rights to all articles immediately upon publication	20 p	Generous reuse & remixing rights (e.g., CC BY license)	20 p	Author holds copyright with no restrictions	16 p	Author may post any version to any repository or website with no delay	16 p
	1285, 74.4%		136, 7.9%		74, 4.3%		305, 17.7%	
	Free readership rights to all articles after an embargo of no more than 6 months	16 p	Reuse, remixing, & further building upon the work subject to certain restrictions & conditions (e.g., CC BY-NC & CC BY-SA licenses)	14 p	Author retains/publisher grants broad rights, including author reuse (e.g., of figures in presentations/teaching, creation of derivatives) and authorization rights (for others to use)	10 p	Author may post some version (determined by publisher) to any repository or website with no delay	10 p
	49, 2.8%		108, 6.3%		1247, 72.2%		949, 54.9%	
	Free readership rights to all articles after an embargo greater than 6 months	12 p	Reuse (no remixing or further building upon the work) subject to certain restrictions and conditions (e.g., CC BY-ND license)	7 p	-		Author may post some version (determined by publisher) to any repository or website with some delay (determined by the publisher)	6 p
	145, 8.4%		476, 27.5%				110, 6.4%	
	Free and immediate readership rights to some, but not all, articles (including "hybrid" models)	5 p	Some reuse rights beyond fair use for some, but not all, articles (including "hybrid models")	4 p	Author retains/publisher grants limited rights for author reuse (e.g., of figures in presentations/teaching, creation of derivatives)	4 p	Author may post some version (determined by publisher) to certain repositories or websites, with or without delays	4 p
	25, 1.4%		25, 1.4%		25, 1.4%		7, 0.4%	
	Subscription, membership, pay-per-view, or other fees required to read all articles	0 p	No reuse rights beyond fair use/dealing or other limitations or exceptions to copyright (All Rights Reserved)	0 p	Publisher holds copyright, with no author reuse beyond fair use	0 p	Author may not deposit any versions to any repositories or websites at any time	0 p
	224, 13%		983, 56.9%		382, 22.1%		357, 20.7%	

Figure 12. Open Access Spectrum Evaluation Tool score distribution of Spanish journals (in percentages of the maximum of 72 points total per journal).